

Replace by
APP 34

Further, materials of the magnetization fixed layer and the antiferromagnetic layer, the presence or absence of the antiferromagnetic layer, the presence or absence of the laminated ferri structure on the side of the magnetization fixed layer can be variously modified without spoiling the essence of the present invention.

The magnetoresistive device such as the above-mentioned TMR devices 1, 10 is suitable for use with a magnetic memory apparatus such as an MRAM. An MRAM using the TMR device of the present invention will be described below with reference to the drawings.

FIG. 4 shows a cross-point type MRAM array including the TMR device according to the present invention. This MRAM array includes a plurality of word lines WL, a plurality of bit lines BL extending in the direction perpendicular to these word lines WL and memory cells 11 in which the TMR device of the present invention is disposed at a point of intersection between the word line WL and the bit line BL. More specifically, in this MRAM, 3 x 3 memory cells 11 are disposed in a matrix fashion.

The TMR device for use with the MRAM array is not limited to the TMR device 1 shown in FIG. 1 but it may be the TMR device 10 having the laminated ferri structure shown in FIG. 3 having any arrangement so long as the arrangement has the laminated structure of the crystalline magnetization fixed layer/intermediate layer/amorphous magnetization free layer in